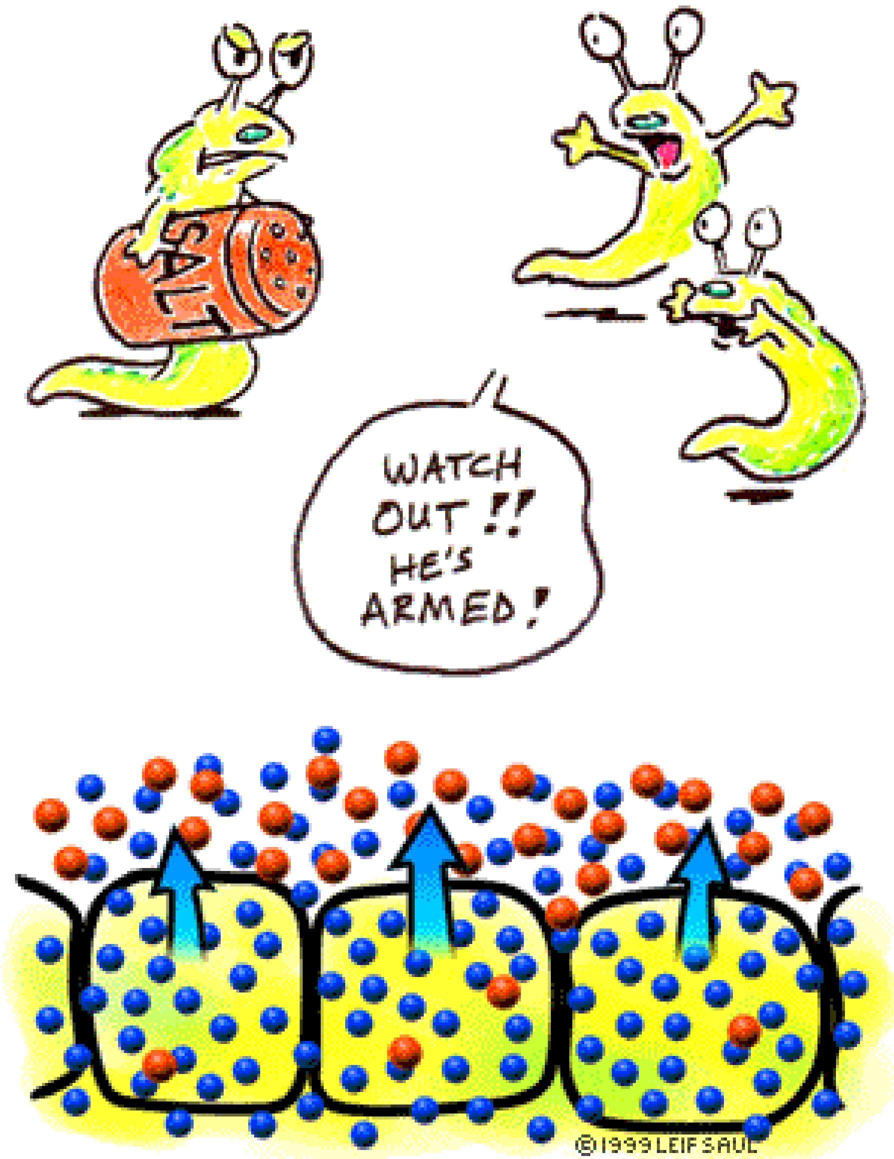
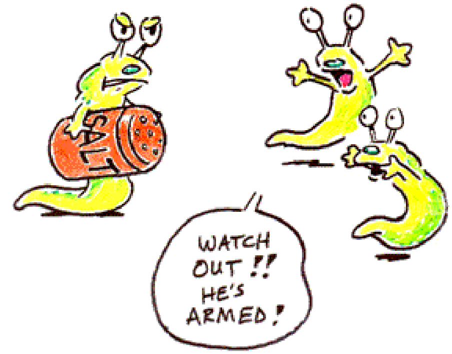
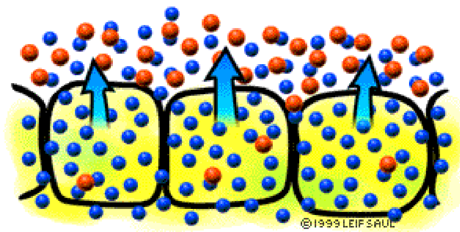
Guess the lesson!

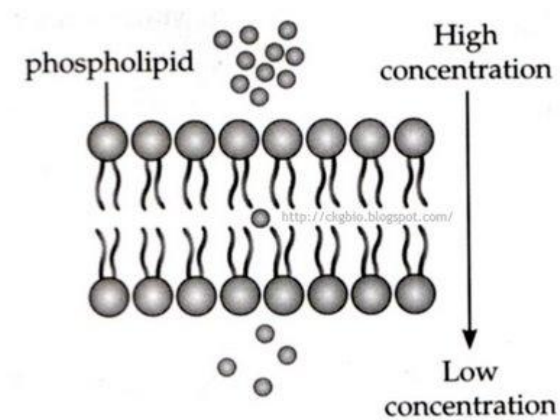




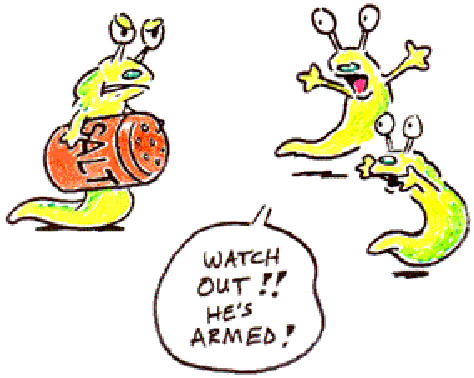


Passive Transport Mechanisms

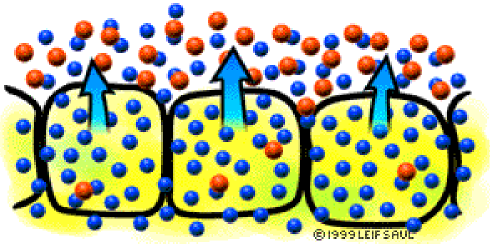
Aim: To understand how **water** crosses the plasma membrane ***passively***



Osmosis



Learning Objectives

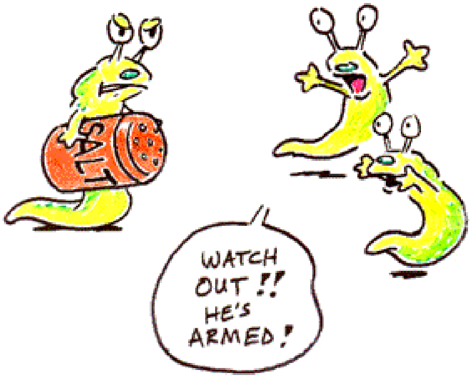


1. **Describe** passive processes of movement across cell membranes (C)

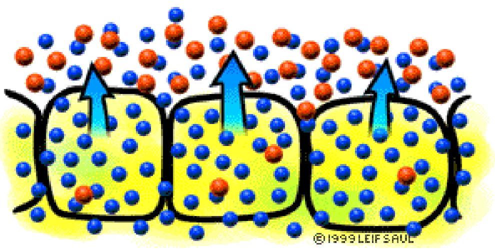
2. **Explain** water potential using psi (B)

3. **Predict** the effects of different water potentials on The Naked Egg.

Write your old definition for osmosis:



Water moves from [high] of water molecules to [low] of water across a semi-permeable membrane.



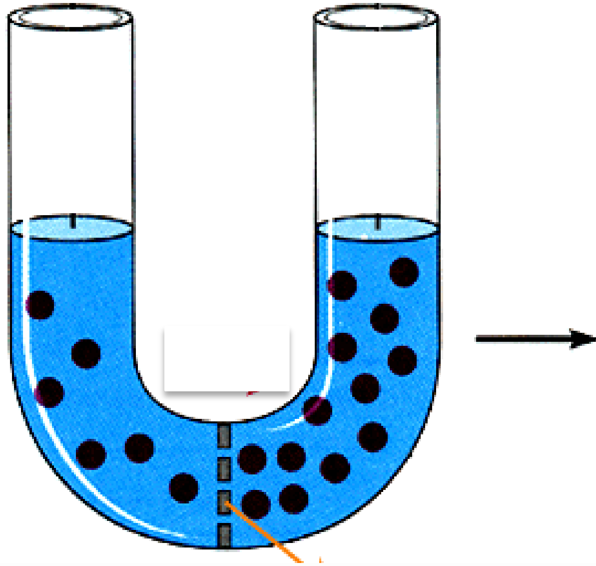
New definition for osmosis:

Water moves from a **high water potential** to a **low water potential** across a **selectively** permeable membrane.

What will happen?

Water moves from an area of **high** water potential to an area of **low** water potential.

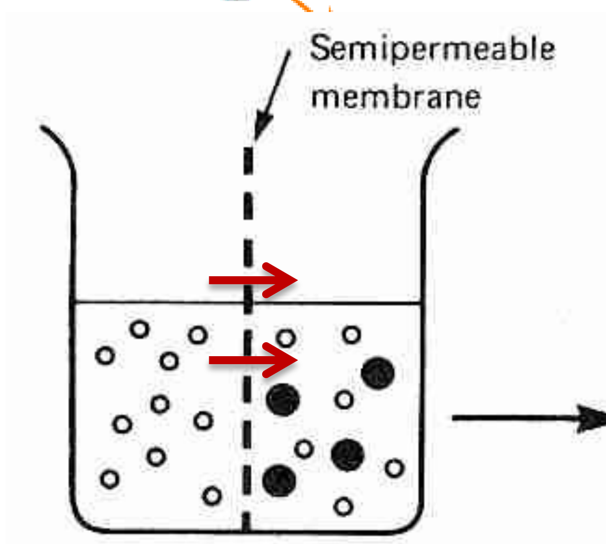
Net-flow of water



WP on left is higher than on right.

What will happen?

Net-flow of water



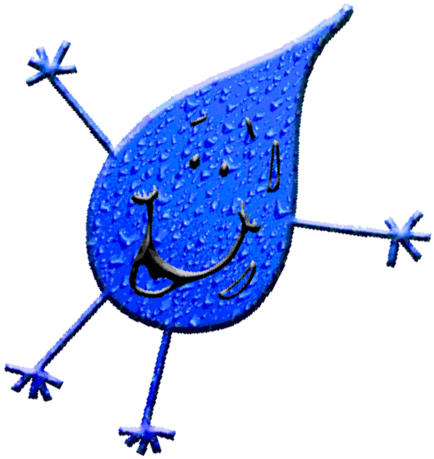
Pressure

WP on left is higher than on right.

What will happen?

Water Potential: Ψ

- How easy it is for water to move from one area to another by osmosis is expressed by:
- **Greek letter psi, Ψ**
- Measured in: **KPa** (kilo pascals)



- Pure water = 0 (the highest)
- Solution always = negative, e.g. -6KPa.

- Stronger solutions have **more negative** water potential (less water in total)

Meet Mr Psi!
He likes to get high, but when he is high he wants to go somewhere lower

Water Potential: Experiment!

Have you ever seen a naked egg?

- The membrane is **selectively-permeable…**
- The egg has an unknown "Ψ or Ψs"

What type of solution do we put the egg into make it…

1. **Gain water?**
2. **Lose water?**
3. **Stay the same?**

Higher water potential or high Ψ
Lower water potential or low Ψ
Same water potential or equal Ψ

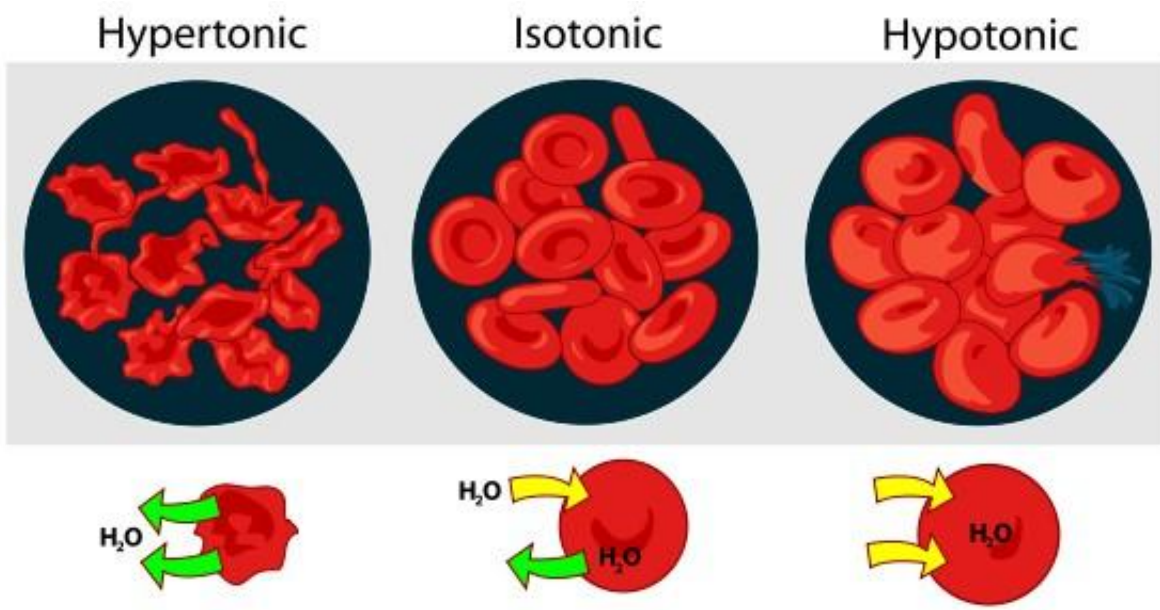
$CaCO_3 + 2CH_3COOH \rightarrow Ca(CH_3COO)_2 + CO_2 + H_2O$

Animal Cell: Water Potential: Ψ_s

- Water potential surrounding animal cell higher than the cell, it gains water, swells and bursts as the membrane does not provide pressure.
- And visa versa

In animal cells:

- **Water potential = Solute potential (always –ve)**



Plant Cell Water Potential = $\Psi_p + \Psi_s$

The cell wall

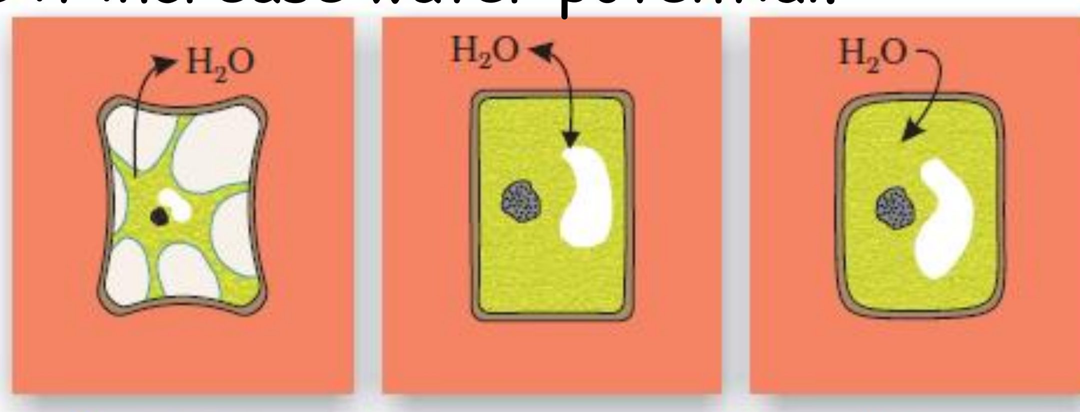
Solute Potential: Ψ_s

- Pure water = zero, more solutes make water potential **more negative**
- Amount of solute = solute potential

Pressure Potential Ψ_p

- Greater pressure inside a cell = greater tendency for water to leave.
- **Always positive** because it increase water potential.

Water potential of a plant cell (Ψ) = $\Psi_s + \Psi_p$

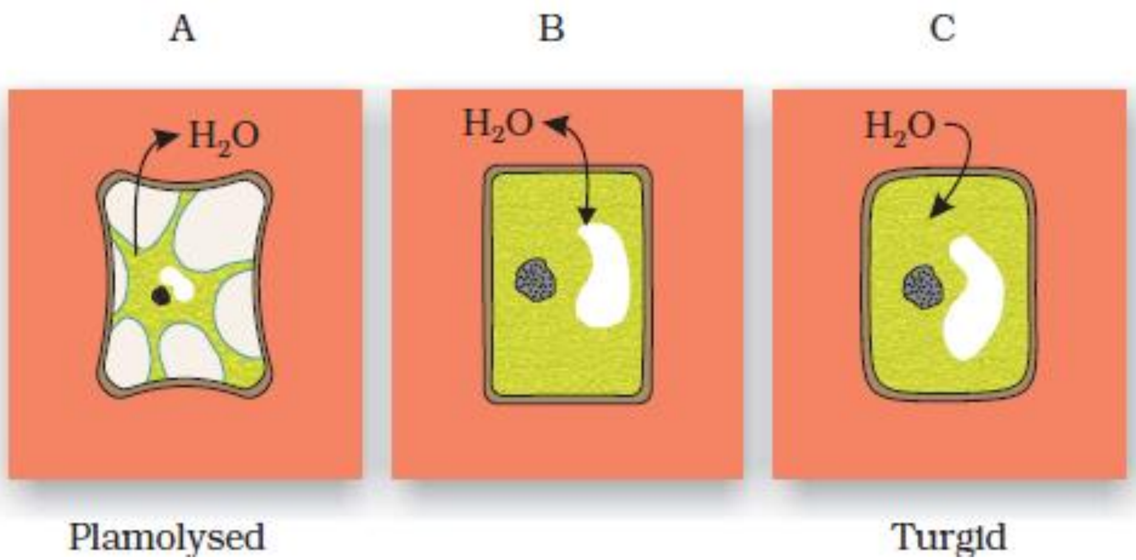


Plamolysed

Turgid

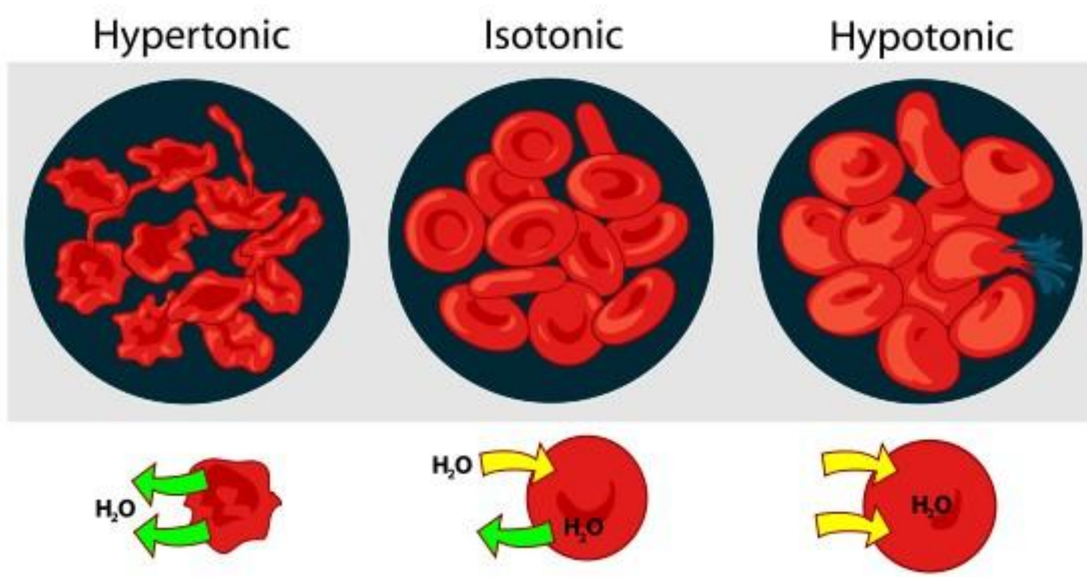
Animal Cell v Plant Cell

Plasmolysed
(cell wall pulled away from membrane)



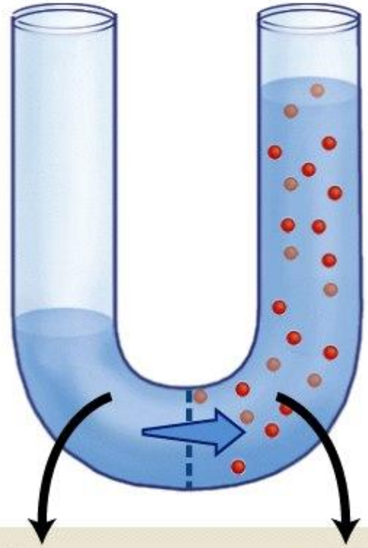
Turgid

Necrosis



Lysis/Bursting

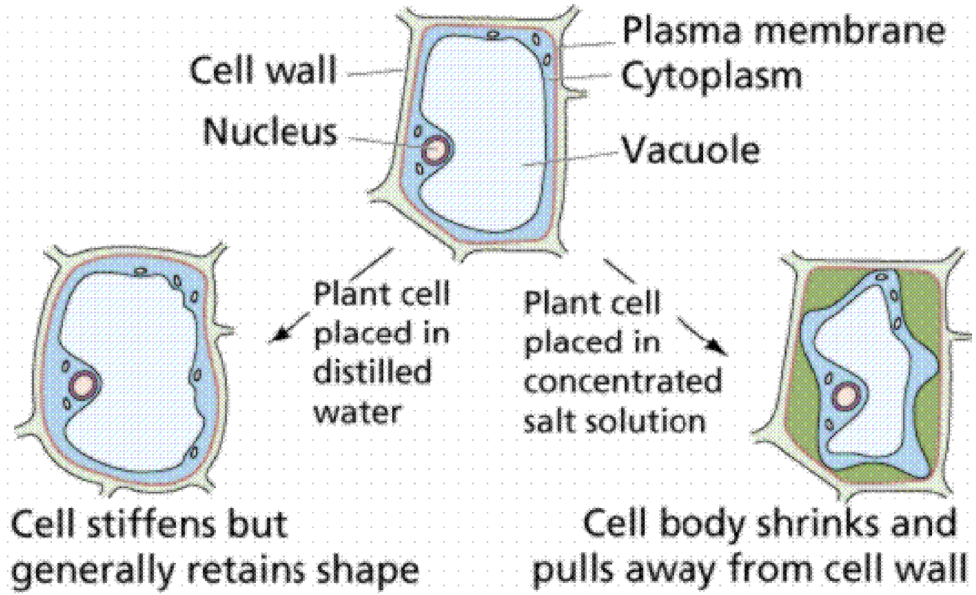
Solute potentials differ.



Pure water	Solution
$\psi = 0$ MPa	$\psi_P =$ 0 MPa
	$\psi_S = -1.0$ MPa
	$\psi = -1.0$ MPa

Water moves left to right—from area with high water potential to area with low water potential

Complete the practice question in the back of your booklet.



Plant cell:

Ψ_p is 200 KPa

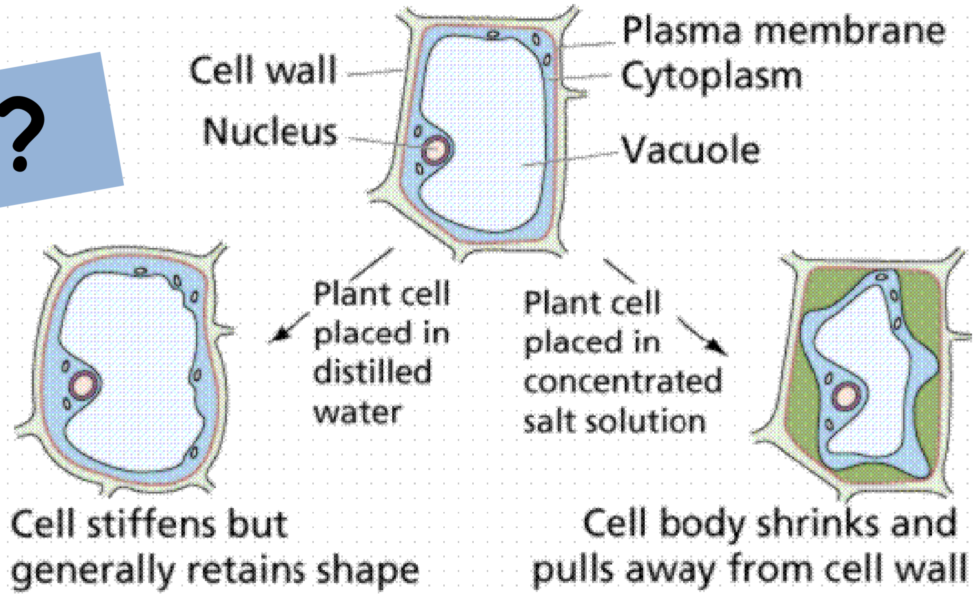
Ψ_s is - 250 Kpa

Q1. What is Ψ for this cell? [2]

Q2. If the cell is placed in a solution with Ψ_s of -250 Kpa, what will happen to the cell? [4]

Complete the practice question in the back of your booklet.

Total out of 6?



Plant cell:

Ψ_s is 200 KPa

Ψ_p is - 250 Kpa

Q1. What is Ψ for this cell? [2] ***Ψs + Ψp = -50 KPa***

Q2. If the cell is placed in a solution with Ψ_s of -250 Kpa, what will happen to the cell? [4]

1. Water moves from low to high water potential (Ψ)
2.Ψs of solution is lower than total Ψ of the cell
3. Water will move from higher Ψ of cell to lower Ψ of cell
4. Resulting in a net loss of water from the cell
5. If too much water is lost from the cell it will plasmolyse